



AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (previously presented) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:
 - a beam forming module to transform a UV radiation source raw output into a rectangular beam;
 - a gas injection module to deliver at least one reactant gas to the substrate surface;
 - a reaction chamber with a UV window through which said beam forming module projects said rectangular beam;
 - a vacuum chuck for holding the substrate; and
 - a gas exhaust module inside said chamber to remove reaction by-products and unreacted reactant gas from the substrate surface,
 - wherein said gas injection module and said gas exhaust module are in close proximity to said rectangular beam, and wherein said rectangular beam, said gas injection module and said gas exhaust module are movable relative to the reaction chamber and the substrate surface.

2. (original) The scanning plasma reactor of claim 1 wherein said UV radiation source raw output is in the wavelength range of 351nm to 157nm.

3. (original) The scanning plasma reactor of claim 1 wherein said rectangular beam has dimensions of approximately 200-300mm in length and 0.1-10mm in width.

4. (original) The scanning plasma reactor of claim 1 wherein said rectangular beam has an energy level at the substrate surface in the range of about 0.1-10 Joules/cm².

5. (original) The scanning plasma reactor of claim 1 wherein said beam forming module consists of a plurality of optical elements.

6. (previously presented) The scanning plasma reactor of claim 5 wherein said beam forming module comprises at least two cylindrical refractive elements.

7. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create an etching reaction on the substrate surface.

8. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create a deposition reaction on the substrate surface.

9. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create an oxidation reaction on the substrate surface.

10. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create a reduction reaction on the substrate surface.

11. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create a melting reaction on the substrate surface.

12. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to modify the surface of a metallic or non-metallic film on the substrate surface.

13. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are combined with the UV radiation to cause a polymerization or UV curing reaction on the substrate surface.

14. (original) The scanning plasma reactor of claim 1, wherein said gas exhaust module comprises a block shaped manifold mounted at one end of the chamber to draws gas across the entire width of the chamber.

15. (cancelled)

16. (original) The scanning plasma reactor of claim 1, wherein said rectangular beam, said gas injection module and said gas exhaust module are moved across a stationary substrate surface.

17. (previously presented) The scanning plasma reactor of claim 1, wherein the substrate surface is moved.

18. (original) The scanning plasma reactor of claim 1 wherein said rectangular beam is focused above the substrate surface to allow interaction with the reactant gas but prevent direct contact between said beam and the substrate surface.

19. (original) The scanning plasma reactor of claim 1 wherein said gas injection module and said gas exhaust module are combined into a gas injection/exhaust system.

20. (original) The scanning plasma reactor of claim 1 wherein said UV window is located on the top of the reaction chamber.

21. (cancelled)

22. (cancelled)

23. (original) The scanning plasma reactor of claim 1 further comprising an electronic control module to programmably select a reactant gas chemistry and an excitation energy level for one or more processes selected from etching, deposition, doping, ion implantation, re-crystallization, UV curing, oxidation, surface roughening, photochemical modification, and reduction reactions.

24. (original) The scanning plasma reactor of claim 1 wherein the substrate surface is transparent to said rectangular beam and said rectangular beam causes a reaction at a layer of the substrate below the substrate surface.

25. (original) The scanning plasma reactor of claim 1 wherein the reactant gases are reacted to create a doping reaction on the substrate surface.

26. (original) The scanning plasma reactor of claim 1 wherein said vacuum chuck includes a heating element to heat the substrate.

27. (original) The scanning plasma reactor of claim 1 wherein said beam forming module includes a mirror which is adjustably positionable to change the angle of said rectangular beam relative to the substrate surface.

28. (cancelled)

29. (previously presented) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a beam forming module to transform a UV radiation source raw output into a rectangular beam;

a gas injection module to deliver at least one reactant gas and at least a second fluid or vapor to the substrate surface;

a reaction chamber with a UV window through which said beam forming module

projects said rectangular beam; and

a gas exhaust module inside said chamber to remove reaction by-products and unreacted reactant gas from the substrate surface,

wherein said rectangular beam and said at least one reactant gas form a reaction zone at or near the substrate surface, said reaction zone being movable relative to the reaction chamber and the substrate.

30. (cancelled)

31. (cancelled)

32. (cancelled)

33. (cancelled)

34. (previously presented) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a beam forming module to transform a UV radiation source raw output into a rectangular beam;

a gas injection module to deliver at least one reactant gas to the substrate surface;

a reaction chamber with a UV window through which said beam forming module projects said rectangular beam; and

a gas exhaust module inside said chamber to remove reaction by-products and

unreacted reactant gas from the substrate surface,

wherein said gas injection module and said gas exhaust module are in close proximity to said rectangular beam, and wherein said rectangular beam, said gas injection module and said gas exhaust module are movable inside said chamber relative to the substrate surface and said chamber.

35. (previously presented) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a beam forming module to transform a UV radiation source raw output into a rectangular beam;

a gas injection module to deliver at least one reactant gas to the substrate surface;

a reaction chamber with a UV window through which said beam forming module projects said rectangular beam; and

a gas exhaust module to remove reaction by-products and unreacted reactant gas from the substrate surface,

wherein said gas injection module is in fixed proximity to said rectangular beam and said gas injection module and said rectangular beam are movable relative to the substrate surface and the chamber.

36. (previously presented) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a beam forming module to transform a UV radiation source raw output into a rectangular beam;

a gas injection module to deliver at least one reactant gas and at least a second fluid or vapor to the substrate surface;

a reaction chamber with a UV window through which said beam forming module projects said rectangular beam; and

a gas exhaust module to remove reaction by-products and unreacted reactant gas from the substrate surface,

wherein said rectangular beam and said at least one reactant gas form a reaction zone at or near the substrate surface, said reaction zone movable relative to the reaction chamber and the substrate and wherein said gas exhaust module is moveable with said reaction zone.

37. (currently amended) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a beam forming module to transform a UV radiation source raw output into a rectangular beam;

a reaction chamber with a UV window through which said beam forming module projects said rectangular beam;

a gas injection module including a delivery nozzle inside the reaction chamber to deliver at least one reactant gas to the substrate surface;

a linear translation stage connected to both said beam forming module and said gas injection module configured to translate said delivery nozzle and said rectangular beam within said reaction chamber relative to said substrate surface for delivering said reactant gas and said rectangular beam at or near said substrate surface within the reaction chamber; and

a gas exhaust module inside said reaction chamber to remove reaction by-products and unreacted reactant gas.

38. (new) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a reaction chamber including a UV window;

a beam forming module to transform a UV radiation source raw output into a beam and for projecting the beam through said UV window;

a gas injection module inside the reaction chamber to deliver at least one reactant gas to the substrate surface;

a gas exhaust module inside the reaction chamber to remove reaction by-products and unreacted reactant gas from the substrate surface; and

means for translating the beam forming module, the gas injection module, and the gas exhaust module together over the substrate surface for delivering the reactant gas and the beam at or near said substrate surface within the reaction chamber.

39. (new) A scanning plasma reactor for exciting or ionizing reactant gases with UV radiation at a substrate surface comprising:

a reaction chamber including a UV window;

a movable beam forming module to transform a UV radiation source raw output into a beam and for projecting the beam through said UV window to a reaction zone;

a movable gas injection module inside the chamber proximate the beam to deliver at least one reactant gas to the substrate surface at the reaction zone; and

a movable gas exhaust module inside the chamber proximate the beam to remove reaction by-products and unreacted gas from the substrate surface at the reaction zone.